THE DISTRIBUTION AND ABUNDANCE OF BABOONS *(PAPIO ANUBIS*) IN SAMBISA GAME RESERVE

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ABSTRACT

Base line information on animal population distribution and abundance is crucial to planning and implementation of effective management strategies for the conservation of species. There is paucity of information on the distribution and abundance of papio anubis in Sambisa game reserve. Therefore, this study was carried out to obtain information on estimate, population structure and abundance of the species, as well as habitat disturbances. The line transect sampling method was used for the enumeration. The data obtained was analyzed using the software package DISTANCE 6.0 to determine population density estimate. The result indicated that Baboon population was concentrated in three ranges of the Reserve a Range has suffered habitat disturbances resulting into insignificant number of primates. The mean encounter rates (MERs) for the species was 1.85km^{-1}. Baboon had the estimated density of about 12km^{-2}. There was a significant difference in the pattern of the species densities for morning and evening counts. The mean encounter rate for Baboon were 1.15 km^{-1} (n=110) and 0.71 km^{-1} (n= 68) individual animals for morning and evening sightings respectively. The relative density for the primate species across the four ranges in the reserve revealed that Baboon was not recorded in Balda range and only 2 individuals sighted in Jeltere. Kwada and yuwe range have the highest abundance of 119 and 57 individuals sighted respectively. The population structure shows declining trend as number of juveniles was relatively lower than adult population. However, the relatively higher percentage of female adults may result in population growth, if majority of them are within the breeding age. The highest numbers of primate species were found in the centre of the reserve (Kwada and Yuwe) where habitat disturbances were controlled.

Keywords: Animal distribution, range, density, encounter rate, Baboon population

INTRODUCTION

The nonhuman primates have a wide distribution throughout the tropical latitudes of Africa. Within this tropical belt which lies between latitudes 25° N and 30° S, they have a considerable vertical range. In Ethiopia the gelada (genus *Theropithecus*) is found living at elevations up to 5,000 meters above sea level (Mittermeier, 1987).

The most well known of the African apes is the common chimpanzee (*Pan troglodytes)*. Most primate species live in tropical forests, where the major threats are habitat destruction and hunting by humans (Mittermeier, 1987). primate species reduced in abundance in areas where they are heavily hunted, and hunting has caused local extinctions (Mittermeier, 1986). With few

exceptions, primate populations in forests sufficiently degraded by human activity, such as logging, show similar responses (Struhsaker, 1997; Cawlishaw and Dunbar, 2000). Habitat degradation and hunting can also elicit changes in social structure. Variation in social group size is largely determined through a compromise between foraging and predation avoidance (Struhsaker, 1997). Significant decreases in resources cause increased intra group competition and potentially decreased social group cohesion (Gillespie and Chapman, 2001). The demographic and sociological responses to forest degradation will depend on the degree of dependence on forest habitat. The impact of hunting by humans on social group size is less clear due to confounding factors and limited data. Small groups tend to be more common in hunted areas, through increased mortality or behavioral responses (Cowlishaw and Dunbar, 2000).

Census of nonhuman primates over time is necessary for monitoring population trends, which is important for designing and evaluating management practices (Gibbs *et al.,* 1998; Kremen *et al*., 1994). Census data also provide the baseline for more detailed socio-ecological and behavioral studies (Butynski, 1990). Line transect census is the most commonly used method in forest primate abundance studies (Chapman *et al* 1988).

Sambisa Game Reserve located in the Northeastern horn of Nigeria is home to several primate species. Some of these include Baboon (*Papio anubis*), Tantalus monkey (*Cercopithecus tantalus*) and Red patas monkey *(Erythrocebus patas*). Baboon and Tantalus monkey are both abundant in this reserve. Wildlife population survey in the reserve has been scarcely carried out with little or no information on the ecology and status of primates; although primate species appear to be relatively abundant, no quantitative data is available. Sambisa game reserve has a wide range of forest habitats with different levels of human activity, which is ideal for investigating anthropogenic influence on primate abundance and distribution. Within the reserve, several patches of forest of importance as centers for biodiversity and water catchments are being degraded. Habitats have been affected by logging, grazing of livestock and human activities such as farming. Rodgers *et al*. (1980) and Dinesen *et al*. (2001) reported that the range of endemic primates is restricted by habitat fragmentation. A preliminary comparison between 2 forest reserves further suggested that human activities have led to a decline in primate group abundance and social group size (Pedersen and Topp, 2000). Hunting can seriously affect the population of primate. Hunting is common throughout Nigeria (Oates, *et al,* 2001). However, some communities consider certain animals sacred thus it is not hunted (Oates *et al,* 2000).

Information on the distribution and abundance of Baboon in the reserve is scanty. This study estimated relative abundance and assesses habitat dependence of the species relative to human forest uses.

METHODS

Sambisa Game Reserve is situated in the southern part of Borno state approximately 70 km by road from Maiduguri town. The study area lies between longitude $13^{o}30^{1}$–$14^{o}00^{1}$E and latitude$12^{o}00^{1}$–$13^{o}30^{1}$N (Agboola, 1987). It is bordered by Konduga, Gwoza and Bama Local Government Areas to the north, south and east respectively. The Reserve was the combination of two contiguous Northern and Southern Sambisa Native Authority Forest Reserves and was constituted and gazetted in

1977 as Game Reserve. It has an area of approximately 518 Square Kilometres (MAFR 1997).

The line transect method for surveying vertebrate reviewed by Buckland *et al.* (1993) was adopted for the determination of the relative abundance of the constituent species of primates in the study area. The sketch map of the reserve was used to select where transects were located. The streambed of river Yadzaram that cut across the 3 major ranges of the reserve was used as transects line and their orientation runs through East-West and West-East direction in Kwada, Jeltere, Yuwe and Balda range respectively. Starting point for each transect was randomly selected and its bearing was determined using magnetic compass. Transect lines were run perpendicular to the streambed. There were 4 line transects (T1–T4) in each range of the reserve of 3 km long and positioned 2 km apart. Each line was clearly distinguished by its unique number. Because of the savannah nature of vegetation clearance to facilitate movement along transect was very minimal. With the use of 50 meter tape every distance at 100 meter along the transect lines was marked by writing on marker tape and tightened on a tree or sapling by the side of the distance.

Survey for direct observation of primates was done in the morning and evening. Census data was obtained via line transects methods. Daytime census walks was carried out at 07:00–10:45hours at an average speed of about 1 km h^{-1}, including a pause at every 100 meters looking from side to side recording all sightings of primates. Additional repeated evening walks censuses were done between 16:00-19:45 hours. At the start of each transect walk, the top part of the data sheet that contained information on observers names, name of transect, coordinate and date was filled. While running through the survey line, when primates were sighted or their presence was detected either by branch movement or alarm call, this was recorded immediately on the data form. For each primate sighting the recorded parameters are the time, species, estimated number of individuals, closest distance from transect to the first individual seen (perpendicular distance), and location of the observer along the transect. The estimated location on transect was obtained by referring to numbered tags placed every 100 meters along the trails. Perpendicular distance was determined by direct measurement using 50 meter tape. Transect line was surveyed twice (morning and evening) each and was repeated at fourth weeks. Total distance of 192 km of transect line was surveyed within 8 weeks and 190 observations were made.

Data obtained from this study was organized for analysis. A comprehensive computer software package Microsoft excel (Ms excel) called *DISTANCE* version 6.0 was used. The software facilitates all the computations and plotting needed in the analysis. Analysis phase involves exploratory phase that takes care of preparation of histograms of the distance data under several groupings to assess presence of heaping, evasive movement, outliers and the occasional gross

error. The distance program allows explanatory option like grouping or truncation of data set prior to further analysis (Rebecca and Brigida, 2004). Pearson correlation coefficient was calculated to determine differences in variables for abundance and population studies.

RESULTS

The *Distance* software models with different adjustment factors were used to analyse data. The best model for each of the categories was

selected based on *akaike* information criterion (AIC) value.

Table 1 presents the estimates of density and abundance for Baboons in the study area. The result reveals that baboon was sighted with a total number of 178 sightings after a survey effort of 96km. The mean encounter rates (MERs) for the species was 1.85km^{-1}. Baboon has the estimated density of about 12km^{-2}.

Table 1: Estimates of density and abundance of Baboon in Sambisa game reserve

Species	n	% of total sightings	N	MER	Dkm^{-2}	CI	AIC
Baboon	178	42.38	6399	1.85	12.35	7.45-20.49	1553.7
Total	178	42.38	6299	1.85	12.35		

N.B: n = observation; N = estimated abundance; MER = mean encounter rate (nkm^{-1}); D = density; CI = confidence interval; AIC = akaike information criterion

The result of sightings during diurnal and nocturnal surveys for baboons shows that 110 and 68 animals were sighted during the day and at night respectively. The results for the encounter rates and density reveal that it has mean encounter rates of 1.15km^{-1} and 0.71km^{-1} with corresponding densities of 7.51km^{-2} and 4.84km^{-2} during diurnal and nocturnal surveys respectively. The relative density for the species across the four ranges in the study area is presented in Table 2. There was no baboon sighted in *Balda* range.

A total of 2 sightings were recorded in *Jeltere* range, 119 sightings were recorded in *Kwada* range. A total of 57 baboons were sighted in the *Yuwe* range. Baboon was not encountered in *Balda* range. Baboon has mean encounter rates (MERs) of 0.17, 2.48 and 1.58 in *Jeltere*, *Kwada* and *Yuwe* ranges of the reserve respectively The estimated densities of baboons were 1.07km^{-2}, 19.09km^{-2} and 10.12km^{-2} in *Jeltere*, *Kwada* and *Yuwe* ranges respectively.

Table 2: Relative densities of Baboon across the four ranges of Sambisa game reserve

species / Range	Baboon		
	N	MER	Dkm^{-2}
Balda	Ns	-	-
Jeltere	2	0.17	1.07
Kwada	119	2.48	19.09
Yuwe	57	1.58	10.12
Total	178	4.23	30.28

N.B: n = observation; MER = mean encounter rate (nkm^{-1}); D = density

Table 3 presents the results of the analysis with respect to the sex and status of the species. The result shows that of the 178 total sightings, 107 baboons were adult females, 52 were adult males, 16 were juveniles and other 3 were sighted from a far distance, and as such could not be classified into the three known categories. Furthermore, the mean encounter rates for adult female, adult male and juvenile baboon were 1.11km^{-1}, 0.54km^{-1} and 0.17km^{-1} respectively. The corresponding densities for the three categories of baboons in the study area were 7.56km^{-2}, 3.46km^{-2} and 1.24km^{-2} respectively.

Table 3: Populations structure of Baboon sighted in Sambisa game reserve

Species / Sex/status	Baboon		
	n(%)	**MER**	**Dkm^{-2}**
Female (adult)	107(60.1)	1.11	7.56
Male (adult)	52(29.2)	0.54	3.46
Juvenile	16(9.0)	0.17	1.24
Unidentified	3(1.7)	0.21	0.19

N.B: n = observation; MER = mean encounter rate (nkm^{-1}); D = density.

DISCUSSION

In the present study, density and abundance of Baboon in the study area was estimated. The aggregate population densities of the species was 12.35, individual km^{-2}. This indicates that the mean encountered rate per kilometer (km^{-1}) walked is impressive with a pronounced differences between the range, the estimated densities for Baboon (per square kilometer (km^{-2}) was 12km^{-2} (*n*=178). The pattern of the species densities for morning and evening count compared revealed a significant difference. The result suggests less activity in the evening with a mean encounter rate of 1.15 km^{-1} (*n*=110) and 0.71km^{-1} (*n*= 68) individual animals for morning and evening sightings respectively. This variation in density estimates for diurnal and nocturnal primate could be caused by different factors. One factor could be that nocturnal monkeys spend much of their time silent and motionless; they can easily go undetected unless the observer relies on a visual search image. With the more active diurnal, the observer is most often alerted to their presence by the sounds of their movements or vocalizations. A similar pattern was observed at *El Tuparro* in Colombia where Defler and Pintor (1985) found that a least active primate, *Alouatta seniculus* was far more likely to be detected by visual cues than other more active primate species. Since diurnal species are more active and vocalize more often than nocturnal species, they are probably less likely to be missed during census walks. Another possible, the influence of moonlight on behavior has been well documented for many nocturnal mammals, including primates.

The population of the species in the 4 ranges was unevenly distributed. The overall result remains significantly lower in *Balda* range, abundance of Baboon was clearly high in *Kwada* considering the number of species sighted, and no Baboon was recorded in *Balda* range and only 2 sighted in *Jeltere. Kwada* and *yuwe* range had the highest abundance of 119 and 57 sighted individuals respectively. The absence of Baboon in *Jeltere* could not be unconnected with habitat disturbances. The

area with the highest primate species was found to be at the centre of the reserve where habitat disturbances were minimal. These apes inhabit a wide range of habitat in primary traverse by *Kwada* stream. The stream mainly passes through *Kwada* and *Yuwe* range of the reserve. This is a real problem to many primate species, which are completely arboreal and might result in isolation of primate populations. This in turn will result in a loss of genetic variability due to genetic drift and inbreeding depression making all these populations more vulnerable to extinction. The floristic composition, and resulting spatial and temporal abundance of food resources, may have a large effect on the abundance and ranging ecology of primates. Percentages of Baboon female adults to adult males and juveniles are 60.1%**,** 29.2% and 9.0% respectively. One of the reasons why adult females had the highest population might be due to nature of primate social structure. The olive baboon lives in groups of 15–150, made up of a few males, many females, and their young ones (Cawthon 2006).

CONCLUSION

The distribution and abundance of Baboons in Sambisa Game Reserve provides a valuable basis for future studies on the species relative ecology as these might explain distribution patterns better in the threatened Sudan savannah forests. If these studies are conducted for some times, the long term effects, for example extinctions of species might be monitored and the impacts of habitat parameters and human disturbance on habitat could be unraveled more clearly, enabling specific conservation measures for endangered species. The higher density of primates distributed at *Kwada* and *Yuwe* range could be partly explained by the *Kwada* stream drainage and higher productivity of these sites. The floristic composition, and resulting spatial and temporal abundance of food resources, may have a marked effect on the abundance and ranging ecology of primates at the reserves' area. The low primates densities at *Balda* range, which had been subjected to a history of hunting pressure and habitat disturbances due to its proximity to human settlements near the buffer zone, underlines the limited carrying capacity of the range.

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